U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Notophthalmus perstriatus

Common Name:

Striped newt

Lead region:

Region 4 (Southeast Region)

Information current as of:

04/21/2015

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

___ Continuing Candidate

_X_ Candidate Removal

___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status

___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species

___ Range is no longer a U.S. territory

___ Taxon mistakenly included in past notice of review

___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct

___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

_X_ Insufficient information exists on taxonomy, or biological vulnerability and threats, to support listing

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 07/15/2008

90-Day Positive:03/23/2010

12 Month Positive:06/07/2011

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, the majority our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements; meeting statutory deadlines for petition findings or listing determinations; emergency listing evaluations and determinations; and essential litigation-related administrative and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of Progress on Revising the Lists, in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Florida, Georgia
- **US Counties**:County information not available
- **Countries**:Country information not available

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Florida, Georgia
- **US Counties**: Alachua, FL, Baker, FL, Bradford, FL, Citrus, FL, Clay, FL, Columbia, FL, Dixie, FL, Duval, FL, Flagler, FL, Gilchrist, FL, Leon, FL, Marion, FL, Nassau, FL, Orange, FL, Putnam, FL, Seminole, FL, St. Johns, FL, Sumter, FL, Suwannee, FL, Union, FL, Wakulla, FL, Baker, GA, Bryan, GA, Camden, GA, Charlton, GA, Emanuel, GA, Evans, GA, Irwin, GA, Jenkins, GA, Lanier, GA, Liberty, GA, Long, GA, Lowndes, GA, Screven, GA, Taylor, GA
- **Countries**:Country information not available

Land Ownership:

Approximately half of all known striped newt ponds occur on Federal land (Apalachicola National Forest, Camp Blanding Military Reservation, Ft. Stewart Military Reservation, Ocala National Forest, Okefenokee NWR, and Osceola National Forest), with the majority of those occurring on Ocala National Forest. State lands account for about 40 percent of known ponds (Fall Line Sandhills WMA, Big Bend WMA, Goethe State Forest, Jennings State Forest, Ohoopee Dunes WMA, Pumpkin Hill Creek Preserve State Park, Rainbow Springs State Park, Ordway Swisher Biological Station, Faver-Dykes State Park, Half Moon WMA, Triple N Ranch WMA, Guana River WMA, and Guana Tolomato Matanzas National Estuarine Research Reserve), and several private lands account for the remaining 10 percent of ponds.

Lead Region Contact:

ARD-ECOL SVCS, Erin Rivenbark, 706-613-9493, erin_rivenbark@fws.gov

Lead Field Office Contact:

N FLORIDA ESFO, Jodie Smithem, 904-731-3134, jodie_smithem@fws.gov

Biological Information

Species Description:

The striped newt (Notophthalmus perstriatus) is a small salamander that reaches a total length of 2 to 4 inches (5 to 10 centimeters) (Conant and Collins 1991, p. 258). A continuous red stripe runs the length of the side of its trunk and extends onto the head and tail where it may become fragmented. The stripe is dark-bordered, but not so boldly and evenly as in the broken striped newt (N. viridescens dorsalis) (Conant and Collins 1991, p. 258). There may be a row of red spots along the side of the body and a faint light stripe down the center of its back. The ground color of the sides and back is olive-green to dark brown. The belly is yellow, usually sparsely marked with black specks. The skin of newts tends to be rougher and less slimy than other salamanders. The costal grooves (grooves along the side body of salamanders used in species identification) are indistinct.

Taxonomy:

There are three species of Notophthalmus found in North America. These include the eastern newt (N. viridescens), the black-spotted newt (N. meridionalis), and the striped newt (N. perstriatus). The three species are found in different areas throughout the United States and Mexico (Reilly 1990, p. 51). Reilly (1990, p. 53), in his study of Notophthalmus spp., found that N. perstriatus and N. meridionalis are distinct species that are more similar and phylogenetically more closely related than either is to N. viridescens. In 2008, Zhang et al. (2008, pp. 586 and 592) looked at the phylogenetic relationship (i.e., evolutionary history of an organism) of the family Salamandridae and found that the clade (i.e., group of species that includes all descendants of a common ancestor) containing newts was separate from the clade containing “true” salamanders. The branching order of the clades for newts are: primitive newts (Echinotriton, Pleurodeles, and Tylototriton), New World newts (Notophthalmus and Taricha), Corisca-Sardinia newts (Euproctus), modern European newts (Calotriton, Lissotriton, Mesotriton, Neurergus, Ommatotriton, and Triturus), and modern Asian newts (Cynops, Pachytriton, and Paramesotriton). New World newts, which include Notophthalmus, originally evolved from salamandrids migrating from Europe to North America via the North Atlantic land bridge during the Mid-Late Eocene (Zhang et al. 2008, p. 595).

Several recent genetic studies looked at whether populations of Notophthalmus perstriatus that occur in two regions separated by 125 kilometers (km) (78 miles (mi)) exhibit genetic and ecological differentiation showing that these two regions are separate conservation units (May et al. 2011, p. 1442; Hoffman 2012, p. 5). One region consists of populations located in peninsular Florida and southeastern Georgia, and the other region consists of populations located in northwestern Florida and southwestern Georgia (Dodd and LaClaire 1995, p. 42; Franz and Smith 1999, p. 13). May et al. (2011, p. 1446) found that there is gene flow between localities within each region, but none were shared between regions. Johnson (2001, pp. 107,113–115) found genetic exchange between populations is minimal or nonexistent due to upland habitat fragmentation that has limited long-distance dispersals and restricted gene flow. In 2001, Johnson (2001, p. 115) found there was enough genetic divergence to show that the western region is different than the eastern regions. However, May et al. (2011, p. 1448) did not find that there was sufficient genetic divergence to support splitting eastern and western regions into separate species. Since these genetic studies, a population has been found in Taylor County, Florida, in the purported distributional gap (Mays and Enge 2014, p. 275). This population is closest to the western region, but its genetic affiliation is unknown.

May et al. (2011, p. 1447) ran niche-based distribution models that showed there were significant climatic and environmental differences between the two regions when considering temperature and precipitation. The western region is characterized by lower mean temperatures and more extreme winter cold, coupled with higher variation in temperature and precipitation. These differences in temperatures and precipitation between the regions should be considered if translocation between regions is to be used for conservation of this species. Understanding genetic structure and species ecology will ensure that genetically similar individuals are moved between areas with similar environmental conditions.

Habitat/Life History:

Habitat

Ephemeral ponds are important components of upland habitat in the southeastern United States (LaClaire and Franz 1990, p. 9). Ephemeral ponds tend to be described as small (typically less than 5 hectares (ha) (12.4 acres (ac)), isolated wetlands with a cyclic nature of drying and refilling known as hydroperiods. Ephemeral ponds can hold water at various times throughout a year to allow for reproduction. Precipitation is the most important water source for ephemeral ponds (LaClaire and Franz 1990, p. 12). The cyclical nature of ephemeral ponds prevents predatory fish from inhabiting breeding ponds (Dodd and Charest 1988, pp. 87, 94; LaClaire and Franz 1990, p. 12; Moler and Franz 1987, p. 237). Ephemeral ponds are biologically unique, because they support diverse species that are different than species found in larger, more permanent wetlands or ponds (Moler and Franz 1987, pp. 234, 236; Kirkman et al. 1999, p. 553).
The frequency and duration of water in ephemeral ponds creates different zones of vegetation within ponds. One species, maidencane (Panicum hemitomon), has been found at ephemeral ponds where striped newts have been found, and seems to be a good indicator of the extent of previous flooding in ponds (LaClaire 1995, p. 88; LaClaire and Franz 1990, p. 10). Persistence of maidencane helps to reduce the rate of oxidation of organic matter, reduce soil moisture loss, and inhibit growth and establishment of upland plant species (LaClaire 1995, p. 94). The center of flooded ponds may contain floating-leaved plants, and is surrounded by vegetation with submerged roots growing along the wet edges. Surrounding the wet areas are tall and short emergents, such as sedges, grasses, rushes, followed by other grasses such as bluestem grass (Andropogon virginicus) found in the drier margins of ponds. Water-tolerant shrubs or trees, such as sandweed (Hypericum fasciculatum), are found in some transitional zones between ponds and uplands (LaClaire 1995, p. 74; LaClaire and Franz 1990, p. 10).

Ephemeral ponds are surrounded by upland habitats of high pine, scrubby flatwoods, and scrub (Christman and Means, 1992, p. 62). Longleaf pine-turkey oak stands with intact ground cover containing wiregrass (Aristida stricta) are the preferred upland habitat for striped newts, followed by scrubby flatwoods and scrub (K. Enge, FWC, personal communication, 2010). Some breeding ponds are surrounded by mesic flatwoods, but more xeric upland habitat is nearby.

Striped newt habitat is fire-dependent, and naturally ignited fires and prescribed burning maintain an open canopy and reduce forest floor litter. An open canopy provides sunlight necessary for ground cover growth needed by newts for foraging and sheltering. Fire is also an important factor for wetland vegetation (LaClaire and Franz 1990, p. 10; Means 2008, p. 4). Historically, fire would be naturally ignited in the uplands during the late spring and early summer, and would sweep through the dry pond basins, reducing organic matter and killing encroaching upland plant species (Means 2008, p. 4; Myer 1990, p. 189). Lack of fire in uplands that buffer breeding ponds allows fire-intolerant hardwoods to shade out herbaceous understory needed by striped newts for foraging and sheltering. As a result, fire shadows may form along the upslope wetland and upland boundary. The vegetation in this area contains fire-intolerant evergreen shrubs (Ilex spp., Vaccinium spp., Morella (formerly Myrica) spp., and Ceratiola spp.) and sometimes xeric oak hammock zones (LaClaire and Franz 1990, p. 11). Ponds that are completely burned from the upland margin to the opposite margin lack this vegetation; however, if the ponds are filled with water, fire will burn out at the pond, and allow the invasion of fire-intolerant hardwoods (LaClaire and Franz 1990, p. 11). The impacts of fire on these temporary ponds promote species richness of grasses and sedges, especially during droughts (Means 2006, p. 196). To eliminate hardwood encroachment, a prescribed fire regime should be used every 1 to 3 years during May to June, in order to protect striped newt habitat (Means 2006, p. 196).

Striped newts use upland habitats that surround breeding ponds to complete their life cycle. Efts move from ponds to uplands where they mature into terrestrial adults. The uplands also provide habitat for the striped newt to forage and burrow during the non-breeding season (Dodd and Charest 1988, p. 95). Striped newts also use uplands to access alternative ponds that are needed if the original breeding pond is destroyed or the hydroperiod is altered (Means 2006, p. 197). This shows the interdependence between upland and aquatic habitats in the persistence of populations (Semlitsch and Bodie 2003, p. 1219). Semi-aquatic species (such as the striped newt) depend on both aquatic and upland habitats for various parts of their life cycle in order to maintain viable populations (Dodd and Cade 1998, pp. 336–337; Johnson 2001, p. 47; Semlitsch 1998, p. 1116; Semlitsch and Bodie 2003, p. 1219).

Life History

Life-history stages of the striped newt are complex, and include the use of both aquatic and terrestrial habitats throughout their life cycle. Striped newts are opportunistic feeders that prey on frog eggs, worms, snails, fairy shrimp, spiders, and insects (adult and larvae) that are of appropriate size (Dodd et al. 2005, p. 889; Christman and Franz 1973, pp. 134–135; Christman and Means 1992, pp. 62–63). Christman and Franz (1973, p. 135) found that newts were attracted to frog eggs by smell. Feeding behavior of newts has only been documented with aquatic adults; little is known of the feeding habits in the terrestrial stage (Dodd et al. 2005, p. 889).

Aquatic and breeding adults occur in isolated, temporary ponds associated with well-drained sands. Sexually mature adults migrate to these breeding ponds, which lack predatory fish, and courtship, copulation, and egg-laying take place there. Females lay eggs one at a time and attach them to aquatic vegetation or other objects in the water. It may take one female several months to lay all of her eggs (Johnson 2005, p. 94). Eggs hatch and develop into externally-gilled larvae in the temporary pond environment.

Once larvae reach a size suitable for metamorphosis, they may either undergo metamorphosis and exit the pond as immature, terrestrial efts, or remain in the pond and eventually mature into gilled, aquatic adults (paedomorphs) (Petranka 1998, pp. 449–450; Johnson 2005, p. 94). The immature, terrestrial efts migrate into the uplands where they mature into terrestrial adults. Efts will remain in the uplands until conditions are appropriate (adequate rainfall) to return to the ponds to reproduce. Johnson (2005, p. 94) found that 25 percent of larvae became paedomorphs at his study pond. Paedomorphs will postpone metamorphosis until after they have matured and reproduced. At about a year old, they will reproduce, metamorphose, and migrate into the uplands adjacent to the pond (Johnson 2005, pp. 94–95). Once there are proper conditions (e.g., adequate rainfall) at the ponds, the terrestrial adults will move back to the ponds to court and reproduce. Once they return to the ponds, they are referred to as aquatic adults.

Striped newts, as well as other Notophthalmus spp., have long lifespans (approximately 12 to 15 years) in order to cope with unfavorable stochastic environmental events (e.g., drought) that can adversely affect reproduction (Dodd 1993b, p. 612; Dodd et al. 2005, p. 889; Wallace et al. 2009, p. 139).

Movement of striped newts by both emigration and immigration occurs between ponds and surrounding uplands. Adult newts immigrate into ponds from uplands during the fall and winter months, but some newts also immigrate during the spring and summer months as well, when environmental conditions (e.g., adequate rainfall) are conducive to breeding (Johnson 2005, p. 95). Extended breeding periods allow striped newts to adapt to temporary breeding habitats whose conditions fluctuate within seasons (Johnson 2002, p. 395). Even with suitable water levels in ponds, adults emigrate back into uplands after breeding. There is a staggered pattern of adult immigration into ponds and eft emigration into uplands due to the required 6 months for larvae to undergo metamorphosis into efts (Johnson 2002, p. 397).

Suitability of upland habitat around breeding ponds influences the pattern of immigration and emigration of newts and directional movements (Dodd 1996, p. 46; Dodd and Cade 1998, p. 337; Johnson 2003, p. 16). Dodd and Cade (1998, p. 337) found that striped newts migrated in a direction that favored high pine sandhill habitats. Newts migrate into terrestrial habitats at significant distances from their breeding ponds. Dodd (1996, p. 46) found that 82.9 percent of 12 wetland breeding amphibians (including striped newts) were captured 600 meters (m) (1,969 feet (ft)) from the nearest wetland, and only 28 percent of amphibians were captured less than 400 m (1,300 ft) from the wetland. Johnson (2003, p. 18) found that 16 percent of striped newts in his study migrated more than 500 m (1, 600 ft) from ponds. Dodd and Cade (1998, p. 337) showed that striped newts travelled up to 709 m (2,330 ft) from ponds. These long-distance movements of striped newts from breeding ponds to terrestrial habitats suggest that buffer zones around ponds should be established to protect upland habitats, as well as breeding ponds (Dodd 1996, p. 49; Dodd and Cade 1998, p. 337, Johnson 2003, p. 19; Kirkman et al. 1999, p. 557; Semlitsch and Bodie 2003, p. 1219). Trenham and Shaffer (2005, p. 1166) found that protecting at least 600 m (2,000 ft) of upland habitat would maintain a population with only a 10 percent reduction in mean population size in the California tiger salamander (Ambystoma californiense). Dodd and Cade (1998, p. 337) suggested that terrestrial buffer zones need to consider both distance and direction (migratory patterns) when created. Johnson (2003, p. 19) recommended a protected area extending 1,000 m (3,300 ft) from a breeding site as upland "core habitat" surrounding breeding ponds.

Optimal pond hydrology is important for maintaining the complex life-history pathways of striped newts. If there is not enough water in ephemeral ponds, then larvae will not have enough time to reach the minimum size needed for metamorphosis and will die as ponds dry up (Johnson 2002, p. 398). However, permanent ponds could support predatory fish that feed on aquatic-breeding amphibians (Johnson 2005, p. 94; Moler and Franz 1987, p. 235). Variable hydroperiods in breeding ponds over a long time period could result in varying reproductive success. Dodd (1993, p. 610) found a decline in striped newts due to persistent drought conditions. Johnson (2002, p. 399) found that heavy rainfall in the winter of 1997 to spring of 1998 filled ponds to their maximum depth and contributed to the reproductive success at these ponds. At one breeding pond, a minimum hydro-period of 139 days (Dodd 1993, pp. 609–610) was needed for larvae to reach complete metamorphosis. Larvae undergo metamorphosis into efts after a period of 6 months, and in order for larvae to mature into paedomorphs, a breeding pond must hold water for at least a year (Johnson 2005, p. 94). For a paedomorph to successfully reproduce, ponds must hold water for an additional 6 months to allow sufficient time for its larvae to undergo metamorphosis.

Striped newts form metapopulations that persist in isolated fragments of longleaf pine-wiregrass ecosystems (Johnson 2001, p. 114; Johnson 2005, p. 95). Within metapopulations, ponds function as focal points for local breeding populations that experience periods of extirpation and recolonization through time (e.g., "ponds as patches") (Johnson 2005, p. 95; Marsh and Trenham 2001, p. 41). Striped newts typically have limited dispersal, which can lead to pond isolation when stochastic events (e.g., drought) affect rates of colonization and extinction (Marsh and Trenham 2001, p. 41). In order for striped newts to recolonize local breeding ponds within the metapopulation, newts must disperse through contiguous upland habitat (Dodd and Johnson 2007, p. 150). Protecting the connectivity between uplands and breeding ponds of diverse hydroperiods is crucial for maintaining metapopulations (Dodd and Johnson 2007, pp. 150–151; Gibbs 1993, p. 25; Johnson 2005, p. 95). Only a few "stronghold" locations exist, where there are multiple breeding ponds with appropriate upland habitat that allow dispersal to occur among the ponds (Johnson 2005, p. 95). These "stronghold" locations represent different metapopulations across the range of the striped newt (Johnson 2005, p. 95). In Florida, these include Apalachicola National Forest, Ocala National Forest, Jennings State Forest, Katherine Ordway-Swisher Biological Station, and Camp Blanding Joint Training Center. In Georgia, they are found at Joseph Jones Ecological Research Center and Fort Stewart Military Installation (Johnson 2005, p. 95; Stevenson 2000, p. 4).

Historical Range/Distribution:

The range of the striped newt extends from the Atlantic Coastal Plain of southeastern Georgia to the north-central peninsula of Florida and through the Florida panhandle into portions of southwest Georgia (Dodd et al. 2005, p. 887), upward to Taylor County in western Georgia (Jensen and Klaus 2004, p. 403). Prior to 2014, there was thought to be a 125-km (78-mi) separation between the western and eastern portions of the striped newt's range (Dodd et al. 2005, p. 887; Dodd and

LaClaire 1995, p. 42; Franz and Smith 1999, p. 12; Johnson 2001, pp. 115–116). However, in February of 2014, researchers found three adult striped newts (2 males and 1 female) in one pond, and two adult males in a small, algae-lined hole of a dry depression marsh, in the Spring Creek Unit of Big Bend WMA located in Taylor County, Florida (Mays and Enge 2014, p. 275). This discovery represents a significant possible range connection, as the newly-discovered pond is located 43 miles east of the previously-known closest pond in Wakulla County, Florida, and 52 miles west of the previously-known closest pond in Gilchrist County, Florida.

The historical range of the striped newt was likely similar to the current range (Dodd et al. 2005, p. 887). However, loss of native longleaf habitat, fire suppression, and the natural patchy distribution of upland habitats used by striped newts have resulted in fragmentation of existing populations (Johnson and Owen 2005, p. 2).

In Figure 1, we provide a map illustrating the current and historical ranges of the striped newt on public lands. The dark-shaded areas represent the currently occupied sites documented from 2005 to 2014 surveys of public lands (Enge 2011, pp. 22-24; Enge et al. 2014a, pp. 130–133; J. Jensen, Georgia Department of Natural Resources (GADNR), personal communication, 2013). The speckled areas represent areas where striped newts may be extirpated (R. Means, Coastal Plains Institute and Land Conservancy (CPI), personal communication, 2013; J. Jensen, GADNR, personal communication, 2013), but more information or consensus is needed for conclusiveness. The light-shaded areas represent the historical range where striped newts are now extirpated. There are from 1 to 30 breeding ponds documented within dark-shaded areas. However, due to the scale of the map, the specific ponds are not identified. In addition to the two ponds discovered in Taylor County, Florida, researchers also discovered 15 striped newts (14 paedomorphs and 1 non-gilled adult) in a pond at Triple N Ranch WMA located in Osceola County, Florida (Enge et al. 2014b, p. 275). This discovery represents the first record from Osceola County and a significant range extension, as the newly-discovered pond is located 35.5 miles SSE from the previously-known closest pond in Orange County, Florida. Both discoveries are specifically noted on the map. This map represents the best available information used to establish the species' range.

To determine where there may be additional unsurveyed suitable habitat for striped newts in Florida, Endries et al. (2009, pp. 45–46) developed a striped newt habitat model. The model was developed using Florida Fish and Wildlife Conservation Commission (FWC) 2003 landcover classes. Three classes were identified: (1) Breeding (bay, cypress swamp, freshwater marsh, wet prairie), (2) primary upland (sandhill, xeric oak scrub, sand pine scrub), and (3) secondary upland (hardwood hammocks and forests, pinelands, and shrub and brushland). Then potential habitat was evaluated for each class. Breeding habitat was limited to patches that were less than 9 ha (22 ac) in size and which were contiguous with upland habitats. The primary upland habitats included in the model were those areas contiguous and within 1,000 m (3,300 ft) of breeding habitat. Secondary upland habitat was included for areas that were contiguous and within 500 m (1,600 ft) of primary uplands and 1,000 m (3,300 ft) of breeding habitat.

The GIS analysis found a total of 244,576 ha (604,360 ac) of potential habitat (Endries et al. 2009,

p. 45). Of the potential habitat, 122,724 ha (303,257 ac) occurred on 124 sites within public lands, but only 64 of these sites had greater than 40 ha (100 ac) of potential habitat. The remaining habitat was found on privately owned lands in patches that were greater than 79 ha (195 ac) (Endries et al. 2009, pp. 45–46). Of the potential habitat found on public lands, 55 percent occurred on Ocala National Forest (ONF), 8 percent on Camp Blanding Military Installation, 6 percent on Withlacoochee State Forest, 5.3 percent on Apalachicola National Forest (ANF), and 2.9 percent on Jennings State Forest (K. Enge, FWC, personal communication, 2010). However, no records of striped newt occurrences have been found at Withlacoochee State Forest, even though this appears to be suitable habitat. Ocala National Forest has 67,514 ha (166,831 ac) of potential habitat and 38 occupied ponds, making it the largest “stronghold” for metapopulations for striped newts in Florida (Enge et al. 2014a, pp. 40 and 51). Striped newts are also found in ponds throughout peninsular Florida at Ordway-Swisher Biological Station, Camp Blanding Joint Training Center, Jennings State Forest, Goethe State Forest, Rock Springs Run State Reserve, Faver-Dykes State Park, Seminole State Forest, Big Bend WMA, Guana River WMA, Pumpkin Hill Creek Preserve State Park, , and Triple N Ranch.

Within the panhandle of Florida, striped newts have been found within the Munson Sandhills. This site represents a small physiographic region within the Gulf Coastal Plains in Florida (Means and Means 1998a, p. 3). Striped newts have only been located in the western portion of the Munson Sandhills within the ANF. No newts have been found in the eastern portion of the sandhills since the 1980s, when the area was converted to a dense sand pine (Pinus clausa) plantation (Means and Means 1998a, p. 6). Striped newt distribution continues north of this site to the Tallahassee Red Hills, Tifton Uplands, and Dougherty Plain in southwestern Georgia. However, the Tallahassee Red Hills no longer support the newt. Striped newts were documented once in a breeding pond found in the Red Hills, but this site was dredged, deepened, and stocked with game fish in the 1980s, and no longer supports newts (Means and Means 1998b, pp. 6, 15).

The striped newt is currently known to occur in five separate locations in Georgia, including Fort Stewart, Lentile Property, Joseph W. Jones Ecological Research Center (JJERC), Fall Line Sandhills Wildlife Management Area, and Ohoopee Dunes Wildlife Management Area (J. Jensen, GADNR, personal communication, 2010; L. Smith, JJERC, personal communication, 2010; Stevenson 2000, p. 4; Stevenson and Cash 2008, p. 252; Stevenson et al. 2009a, pp. 2–3). Most of these locations are within the Dougherty Plain (Baker County), Tifton Uplands (Irwin, Lanier, and Lowndes Counties), and the Barrier Island Sequence (Bryan, Camden, Charlton, Evans, and Long Counties) (Dodd and LaClaire 1995, pp. 40–42). In 2013, newts were detected in the Fall Line Sandhills WMA, Lentile Tract (Irwin County), and Ohoopee Dunes WMA (Emanuel County) ponds (J. Jensen, GADNR, personal communication, 2014). From 1993 to 1994, Dodd and LaClaire (1995, p. 40) found striped newts in one pond each at five sites in Irwin, Baker, and Charlton Counties, and a series of ponds at Ft. Stewart in Bryan and Evans Counties. A pond in Baker County at JJERC was found to be a new location, and extends the known range west of the Flint River approximately 115 km (71 mi) farther from the nearest recorded site (LaClaire et al. 1995, pp. 103–104; Franz and Smith 1999, p. 13). Striped newts were first found on Trail Ridge in 1924 near Okefenokee National Wildlife Refuge (ONWR), but this area has been highly modified since the 1940s (Dodd 1995, p. 44; Dodd and LaClaire 1995, pp. 39–40), and newts are no longer found in this area, except for possibly in the ONWR. In 2008, a new striped newt site was found in Georgia in Camden County, which is the first record for this county since 1953 (Stevenson et al. 2009b, p. 248).

Current Range Distribution:

Figure 1. Public and private lands containing current and historic striped newt breeding ponds.

CURRENT STATES/COUNTIES/COUNTRIES OF OCCURRENCE:

• Countries: Unites States
• States/US Territories: Florida, Georgia
• US Counties:
Florida - Alachua, Clay, Duval, Lake, Leon, Levy, Marion, Orange, Osceola, Putnam, St. Johns, Sumter, Taylor

Georgia - Baker, Bryan, Camden, Charlton, Emanuel, Evans, Irwin, Long, Taylor

Population Estimates/Status:

Surveys have been conducted for striped newts at many sites within Florida and Georgia. These surveys have found that the number of known occupied sites has declined and occupied sites are limited to just a few counties. However, historical information on the location of striped newts is difficult to confirm, as most of these sites underwent substantial land use changes since newts were first collected (Dodd et al. 2005, p. 887).

Franz and Smith (1999, p. 8) reviewed 100 records from 20 counties in Florida between 1922 and 1995, and conducted surveys between 1989 and 1995. They found that 4 historical ponds had newts, but also found 34 new ponds containing newts that were not part of the historical records. All 38 breeding ponds were found on 7 public lands that included ANF, Camp Blanding Military Reservation, Favor-Dykes State Park, Jennings State Forest, Katharine Ordway Preserve-Swisher Memorial Sanctuary, ONF, and Rock Springs Run State Reserve (Franz and Smith, 1999, pp. 8–9).

Johnson and Owen (2005, p. 7) visited 51 sites in 11 counties in Florida from 2000 to 2003 that overlapped with the sites visited by Franz and Smith. They found that of 51 sites visited (totaling 64 ponds), only 26 ponds and adjacent upland habitat had excellent habitat quality (e.g., multiple ephemeral ponds surrounded by fire-maintained native uplands) capable of supporting striped newts. Only 4 of these 26 sites had multiple breeding ponds needed to comprise metapopulations. They were found in Clay, Marion, and Putnam Counties at Camp Blanding Military Reservation (Clay), Jennings State Forest (Clay), Ocala National Forest (Marion), and Katherine Ordway Preserve-Swisher Memorial Sanctuary (Putnam) (Johnson and Owen 2005, p. 7).

From 2005 to 20140, Enge (2011) and Enge et al. (2014a) surveyed ponds in suitable habitat on 40 conservation lands in Florida. He found breeding ponds with newts in 73 ponds on 12 of the 40 conservation lands. He also found that although newts had a wider range in Florida than Georgia, they remained abundant only on public lands in Clay, Lake, Marion, and Putnam counties. This is consistent with the surveys conducted by Franz and Smith (1999, pp. 8–9) and Johnson and Owen (2005, p. 7). Enge et al. 2014a (p. 51) determined that at least 44 of 76 identified striped newt populations are probably extant in Florida based upon surveys, other data, and continued existence of suitable habitat. Eleven populations, including all those in the panhandle, are possibly extinct. An isolated breeding pond farther than 1,000 m (3,300 ft) from the closest other breeding pond represents a separate population, unless intervening potential breeding ponds are present (K. Enge, FWC, personal communication, 2010). Large striped newt metapopulations (i.e., multiple breeding ponds with enough upland to allow for dispersal) are now only found on public lands in Clay, Lake, Putnam, and Marion counties. Populations still exist in nine other counties in Florida, but these counties have fewer than five breeding ponds and these populations are considered vulnerable to extirpation (K. Enge, FWC, personal communication, 2010).
In 2013, Enge et al. 2014a (p. 43) found a new striped newt pond 5.3 km north of two known ponds at Guana River WMA in St. Johns County, Florida. The pond is a smaller depression marsh adjacent to scrub habitat that had been sampled in 2010 without success. During two survey efforts, Enge located three paedomorphs and eight large larvae at the new pond and nine paedomorphs and 10 large larvae at the two known ponds. In 2013-2014, Enge et al. 2014a (p. 43) found four new striped newt ponds at Camp Blanding Joint Training Center and seven new striped newt ponds in Jennings State Forest, Clay County, Florida.

In 2014, researchers found striped newts in two counties where the species had been previously unknown: Osceola and Taylor Counties, Florida (Enge et al. 2014a, p. 41). Both of these discoveries dramatically expand the potential area of occurrence for this species.

Data on the status of striped newts on private lands are limited due to the difficulty in accessing these lands. A survey of 227 ephemeral ponds on commercial forest lands in northern Florida in 1996−98 found striped newts in only four ponds in Clay and Putnam counties (Wigley 1999, p. 5). Google Earth imagery and a visual roadside reconnaissance in 2012 of the degraded upland habitat surrounding the three ponds in Putnam County, which are located approximately 100 m apart, suggest that this population is either extinct or in severe decline (K. Enge, FWC, personal communication, 2013). Enge also surveyed five privately-owned ponds in striped newt habitat in 2010, but did not find any newts (FWC, personal communication, 2013).

Striped newt breeding ponds at ANF and other areas within the Munson Sandhills region in Leon County, Florida, have seen a decline. ANF was once considered a metapopulation for striped newts (Johnson 2005, p. 95; Johnson and Owen 2005, p. 7; K. Enge, FWC, personal communication, 2010). However, the western Munson Sandhills in ANF was surveyed from 1995–2007, and researchers were only able to locate 18 breeding ponds (containing larvae or breeding adults) in 265 ephemeral ponds surveyed (Means and Means 1998a, p. 5; Means et al. 2008, p. 6). Means et al. (2008, p. 6) found only 5 adult striped newts and no larvae during their 1997-2007 sampling efforts. Since 2000, severe drought conditions were experienced at these ponds, and newts were shown to be declining. Despite recent survey efforts, the last Munson Sandhills adult striped newt was observed in 2007 (Means et al. 2012, p.14). By 2012, researchers with the Coastal Plains Institute had concluded that the western striped newt within the Munson Sandhills of the ANF likely had become extirpated (Means et al. 2012, p.14). CPI researchers believe that the cause of this probable extirpation is likely the sum of several factors, including long-term drought conditions experienced since the last breeding event, disease, and/or habitat alteration (Means et al. 2008, p.7). The precipitous apparent declines at ANF could occur elsewhere on protected lands within the striped newt's range, despite the protection of habitat. This indicates that perhaps other threats (e.g., disease and drought) may continue to act on the species at these sites.

As mentioned above, striped newts have only been found at five locations in Georgia, and these sites are highly fragmented and isolated (Stevenson 2000, p. 4). An amphibian survey on 196 ephemeral ponds in 17 counties on timber company lands in the Coastal Plain of southeastern Georgia did not locate any striped newts in Georgia; however, striped newts were found in four ponds in Florida (Wigley 1999, pp. 5–10). Stevenson (2000, p. 3) looked at 25 historic striped newt localities in Georgia and was only able to find 2 sites (8 percent) that had multiple breeding ponds and upland habitat that would support striped newt populations. As of 2010, only 2 properties in the State are known to support viable populations: JJERC and Fort Stewart Army Base (J. Jensen, GADNR, personal communication, 2010; Stevenson et al. 2009a, p. 2). The Fort Stewart population lies within the range of the eastern genetic group on the Atlantic Coastal Plain and was represented by approximately 10 known wetlands. Since 2002, striped newts have been found at only one wetland at Fort Stewart (Stevenson et al. 2009, p. 2). The JJERC population lies within the range of the western genetic group on the Gulf Coastal Plain, and is represented by 5 known wetlands. In annual surveys from 2002 to 2010, researchers confirmed striped newts from only 3 of these 5 known wetlands (L. Smith, JJERC, personal communication, 2010). Evidence suggests that both the eastern and western striped newt populations in Georgia are rare and declining. Most suitable striped newt habitat in Georgia has been lost to development or converted to pine plantations and silviculture (Dodd and LaClaire 1995, p. 43).

Distinct Population Segment(DPS):

Not applicable.

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Striped newts have been found to use both aquatic and upland habitats throughout their life cycle. Most of these habitats have been destroyed or modified in the past due to: (1) Conversion of habitat to intensely managed, planted pine plantations or naturally regenerated stands (Dodd 1995b, p. 129; Wear and Greis 2002, p. 46); (2) loss of habitat resulting from urban development (Zwick and Carr 2006, pp. 4–6); (3) degradation of habitat due to fire suppression (Means 2008, pp. 27–28); and (4) degradation of the habitat by the use of off-road vehicles and road construction (Means 1996, p. 2; Means 2001; p. 31, Means 2003 p. 6; Means et al. 1994a., pp. 5–6).

Natural Pine Forest Conversion

Natural pine forests (i.e., longleaf pine forest) that once were found from southeastern Virginia through eastern Texas have declined to about 13 million ha (33 million ac), and planted pine plantations increased to more than 12 million ha (30 million ac) by 1999 (Dodd 1995b., p. 129; Wear and Greis 2002, p. 46). There are presently about 11 million ha (27 million ac) of managed pine plantations where natural longleaf pines were once found (Frost 2006, p. 36). Within the longleaf pine ecosystem in the South's coastal plains, only 2.2 percent of the original range exists (Frost 2006, p. 13; Wear and Greis 2002, p. 66). Between 1936 and 1989, longleaf pine forests within the range of the striped newt in Florida decreased from more than 3 million ha (7.6 million ac) to only 384,500 ha (950,000 ac), an 88 percent decrease (Dodd 1995b., p. 129). Longleaf pine forest in Georgia declined 36 percent between 1981 and 1988 (Dodd 1995b., p. 129).

Habitat loss from the conversion of natural pine forests to intensely managed, planted pine plantations has greatly disrupted the dispersal of striped newts between breeding ponds and upland habitat. Means and Means (1998a, p. 6) found that striped newt habitat at the Munson Sandhills varied due to differences in silvicultural practice between the eastern and western portions of the Sandhills. In the western portion of the Sandhills found within ANF, native groundcover remains in the second-growth longleaf pine forests, where striped newts spend most of their adult life. However, the eastern portion of the Munson Sandhills has been clear-cut and roller-chopped, and planted in sand pine (Pinus clausa), which is now a closed canopy with little native ground cover. Surveys of ponds located in the eastern Munson Sandhills found no striped newts after the site was converted to sand pine plantations (Means and Means 1998a, p. 4; Means and Means 2005, pp. 58–59; Means 2008, p. 30).

Silvicultural practices, including mechanical site preparation, pond ditching, soil disturbance, and the use of fertilizer and herbicides, can interfere with migration and successful reproduction (Dodd 1995b, p. 130; Dodd and LaClaire 1995, pp. 43–44; Means and Means 2005, pp. 59–60; Means 2008, p. 29). Pond ditching, which is used to drain ponds to create ideal conditions for silvicultural operations, is detrimental to striped newts, because it alters pond hydrology and facilitates predatory fish movement into otherwise fishless ponds (Means 2008, p. 30). Ditching creates a shortened hydroperiod, reducing the amount of time striped newts have to undergo metamorphosis, which can eventually decrease the number of reproducing adults (Means 2008, p. 31).

Urban Development

Alteration of upland habitat to urban development can create habitat fragmentation and loss of metapopulations of striped newts. In 10 coastal Georgia counties, the human population is expected to increase 51 percent by 2030 (Center for Quality Growth and Regional Development 2006, p. 4), but no estimate of impact on native habitats was provided. Striped newts have been found within 5 of these counties in Georgia, including Bryan, Camden, Long, Liberty, and Screven Counties (Franz and Smith 1999, p. 13, Stevenson 2000, pp. 6–7). Zwick and Carr (2006, pp. 4–6) modeled human population growth in Florida, and concluded that 2.8 million ha (7 million ac) of land will be converted to urban use by 2060. Of the 2.8 million ha (7 million ac), they estimated that about 1.1 million ha (2.7 million ac) of native habitat would be destroyed to accommodate urban development (Zwick and Carr 2006, p. 2). It is predicted that more than 800,000 ha (2 million ac) of native habitat in Florida will be developed by 2060 within a mile of public conservation lands (Zwick and Carr 2006, p. 19; FWC 2008, p. 8). Urban sprawl where newts occur will fragment striped newt ponds from upland habitats. This will limit movement of newts between breeding ponds and make them more vulnerable to extinction, as the genetic viability of the newts declines (FWC 2008, p. 8). Powerlines and natural gas rights-of-ways impact groundcover associated with longleaf pine adjacent to breeding ponds, creating barriers to dispersal and eventually decreasing populations (Means 2001, pp. 31–32). Striped newt habitat in the Tallahassee Red Hills has been impacted by urban sprawl and land conversion from 1824 to the present, and has resulted in the extirpation of striped newts from this area (Means and Means 1998b, p. 8).

Small, isolated wetlands support breeding populations of striped newts. However, small, ephemeral wetlands (less than 0.2 ha (0.5 ac)) receive no protection from development (Johnson 2003, p. 19; Dodd and Cade 1998, p. 337; see discussion under Factor D below). The loss of these small, ephemeral wetlands can potentially increase extinction rates of newts by limiting migration between ponds and corridors, thus decreasing recolonization of local populations (Gibbs 1993, pp. 25–26; LaClaire and Franz 1990, p. 13; Semlitsch and Bodie 1998, pp. 1131–1132). Green (2003, p. 341) concluded that pond-breeding amphibians, like striped newts, that have highly fluctuating populations and high frequencies of local extinctions are likely to be affected rapidly by habitat fragmentation. The loss of breeding ponds due to habitat destruction will reduce corridors and limit migration between the ponds and the uplands.

Prescribed Fire

Prescribed fire plays an important role in maintaining productive breeding ponds for striped newts (Kirkman et al. 1999, p. 556). Burning in dry ponds is also necessary to maintain the quality of vegetation needed for striped newts (Johnson 2005, p. 97). Fire suppression at many sites with newt breeding ponds has been concurrent with the conversion of uplands to pine plantations (Johnson 2005, p. 97). Lack of fire can result in the succession of natural pine forests converting to fire-intolerant species, dominated by hardwoods (Means 2008, pp. 27–28). Wear and Greis (2002, pp. 46–47) found that 3.9 million ha (9.7 million ac) of natural pine forest throughout the Southeast were reclassified to hardwood and natural oak-pine forests. Of the remaining longleaf pine habitat in the southeast, only 0.2 percent is managed with fire and can support native longleaf pine species of plants and animals, including striped newts (Frost 2006, p. 38). The succession of natural pine forest to more shade-tolerant species, such as oaks and hickories, can result in the loss of ground cover, such as wire grass, needed by striped newts for shelter and foraging (Means 2001, p. 31). Frequencies of prescribed burns in these uplands need to take place in a 1- to 3-year cycle to provide suitable habitat for striped newts (Johnson and Gjerstad 2006, pp. 287–292). This would also reduce the naturally woody components around the ephemeral ponds, and stimulate flowering of grasses used by the newts along the pond margins (Means 2006, p. 196).

In Florida, some public land managers do not currently have the resources to implement effective habitat management programs (Howell et al. 2003, p.10). In a questionnaire to State, Federal, and local land managers throughout Florida, the U.S. Fish and Wildlife Service (Service) asked what impediments they had in effectively using prescribed fire to manage scrub, a fire-maintained ecosystem. Many respondents indicated that funding, staff, and smoke management issues substantially reduced their ability to burn (Service 2006, Excel spreadsheet; Thomson 2010, p. 12). Less than 25 percent of public land managers had been ranked as having an excellent prescribed burn program (Florida Department of Environmental Protection 2007, p. 1). On most public lands in Florida, striped newt habitat is likely to continue to degrade unless land management funding and staffing increase in the future.

Off-road Vehicles and Road Impacts

At their study ponds in the Munson Sandhills at ANF, Means et al. (1994, pp. 6–7; 2008, pp. 11 and 16) found that off-road vehicle (ORV) use had degraded the littoral zone of the breeding ponds into barren sandy beaches unsuitable for striped newts. The littoral zone provides shallow, warm water where small aquatic invertebrates are concentrated, providing food for newts. ORV use also destroys the grasses and grass-like vegetation around the ponds needed by newts for protection from predators such as wading birds (Means et al. 2008, p. 11). In 1994, 27 of 100 ponds at ANF were found to be damaged by ORV use, including 3 of 18 striped newt ponds (Means et al. 1994, pp. 6–7). By 2006, ORV impacts were documented at nearly every pond at ANF (Means et al.

2008, p. 16). However, by 2010, the ANF closed the Munson Sandhills to ORV use to protect the striped newt ponds (C. Petrick, USFS, personal communication, 2010; see discussion under Factor D below).

Striped newts dispersing from breeding ponds to upland habitat are also impacted by roads and highways. These impacts usually result in direct road mortality; desiccation on dry asphalt; and increased exposure to aerial predation (Means 1996, p. 2). At one study pond in ANF, Means (2003, p. 6) found that most striped newts were emigrating and immigrating to and from the breeding pond across a major highway, U.S. 319.

Summary of Factor A

We have identified a number of threats to striped newt habitat that have resulted in the destruction and modification of habitat in the past, are continuing to threaten habitat now, and are expected to continue to threaten striped newt habitat in the future. Indications are that the loss of habitat due to conversion of natural pine forests to more intense silvicultural management regimes will continue in interior portions of the range of the striped newt. Striped newt habitat within the species' range in Florida and Georgia is currently threatened with habitat loss and modification resulting from urban development. Habitat loss and fragmentation due to urban development and road construction are expected to continue in the future. Lack of, or inappropriate use of, prescribed fire is ongoing and likely to continue in the future, and has adverse effects on striped newt habitat and extant populations. On the basis of this analysis, we find that the destruction, modification, or curtailment of the striped newt's habitat is currently a threat and is expected to persist and possibly escalate in the future. Because this threat is ongoing and we expect it will continue over the coming decades; we consider the threat to be imminent. However, based on the large amount of potential habitat that is currently in public ownership, and fact that most of the known striped newt ponds are on conservation lands, we believe the magnitude of this threat is moderate. Based upon our review of the best commercial and scientific data available, we conclude that the present or threatened destruction, modification, or curtailment of its habitat or range is an imminent threat of moderate magnitude to the striped newt, both now and in the foreseeable future.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

The petition provided information that striped newts were collected and sold during the 1970s and 1980s. However, in our 90-day finding (75 FR 13720, March 23, 2010), we determined that there was no evidence to support the existence of any threat under this factor. We obtained no additional information during the 12-month finding status review to indicate that this factor is currently a threat to the species or will become a threat in the foreseeable future. Therefore, based on our review of the best available scientific and commercial information, we conclude that the striped newt is not threatened by overutilization for commercial, recreational, scientific, or educational purposes now or in the foreseeable future.

C. Disease or predation:

In our 90-day finding (75 FR 13720, March 23, 2010), we found no evidence that predation was a threat to the striped newt, and we obtained no additional information during the 12-month finding status review to change that finding. Concerning disease, below we summarize what was previously stated in the 90-day finding (75 FR 13720, March 23, 2010), as well as additional information obtained during the 12-month finding status review.

Disease can be difficult to detect in pond-breeding amphibians. In addition, the rarity of striped newts increases the difficulty of documenting mortality in the species. However, there are reasons to believe that disease may be a possible factor in the decline of striped newts. Chytridiomycosis (a disease caused by Batrachochytrium dendrobatidis) is implicated or documented as a causative agent in many New World amphibian declines (Blaustein and Johnson 2003, p. 91). Ouellet et al. (2005, p. 1434) documented the chytrid fungal infections in the eastern newts (N. viridescens) in North America. A subspecies of the eastern newt, the central or common newt (N. v. louisianensis), has been found in the same ponds as the striped newt at ANF and other ponds in North Florida (Means 2007, p. 19; Means 2001, pp. 19–21; Means et al. 1994, pp. 9–10 and 30–32). The effect of the disease on striped newts is unknown; however, California newts (Taricha torosa) have tested positive for the pathogen in ponds where a die-off of the species was previously reported (Padgett-Flohr and Longcore 2007, p. 177).

Some researchers believe that disease pathogens represent one of the potential causes of decline of the striped newt (Blaustein and Johnson 2003, pp. 87–92). The presence of chytrid fungal infections could particularly threaten populations of striped newts, as they may not have the resiliency to recover after a population crash caused by this disease (Ouellet et al. 2005, p. 1437). Further, the effect of this disease could be exacerbated by other stressors, such as habitat degradation and climate change (Blaustein and Johnson 2003, p. 91; Ouellet et al. 2005, p. 1432; Rothermel et al. 2008, pp. 3, 13). Daszak et al. (2005, p. 3236) found that the impact of Batrachochytrium dendrobatidis on amphibians can vary among species, and several factors, such as climate (i.e., drought) and life-history traits, can affect the species' response to the disease. The presence of this disease in the range of the striped newt is not confirmed, but is a potential cause for concern, given the deleterious effect of the disease on other amphibian species.

A group of viruses belonging to the genus Ranavirus has been shown to affect some local populations and cause localized die-offs of amphibians (Gray et al. 2009a, p. 244). Ranaviruses could be affecting populations of the striped newt, but it is difficult to detect in less abundant species (Gray et al. 2009a, p. 244), and we do not have confirmation that it is present in striped newt populations. However, Means et al. 2012 (p. 15) found through controlled studies that post-metamorphic striped newts (< 1 year in age) are highly susceptible to ranaviral disease, experiencing 60-100% mortality when exposed to three unique ranavirus isolates in water, but that larval striped newts were less susceptible (only 5-15 % mortality). Green et al. (2002, p. 334) found that Ranavirus was the most frequent cause of amphibian mortality in at least 10 species, including the spotted salamander (Ambystoma maculatum) and eastern newt, so this virus may be impacting striped newt populations in breeding ponds where other subspecies of eastern newts, such as the central newt (Notophthalmus viridescens louisianensis), are found. Two reasons for the emergence of Ranavirus in amphibian populations include: (1) reduced amphibian immunity associated with increased occurrence of anthropogenic stressors (e.g. drought), and (2) introduction of Ranavirus strains into amphibian populations by humans (Gray et al. 2009b, p. 2). In 2013, CPI researchers will be testing the Munson Sandhills region of Florida for the presence of ranavirus (Means et al. 2012, p. 24).

Another recently described disease, caused by a fungus-like protist (Amphibiocystidium viridescens), has been reported in eastern newt populations (Raffel et al. 2008, p. 204). Specifically, evidence of mortality and morbidity due to infection with this disease, and the potential importance of secondary infections as a source of mortality, were reported (Raffel et al. 2008, p. 204). Also, Cook (2008) found a striped newt in captivity to be infected with a protistan parasite that has caused disease in other species of amphibians. This parasite, currently identified as Demomycoides spp. (Cook 2007, p. 2), caused disease resulting in a complete loss of recruitment of the Mississippi gopher frog population in Harrison County, Mississippi, in 2003.

Summary of Factor C

We have found that several of the diseases mentioned above have resulted in mortality of species similar to the striped newt, such as the eastern newt (which is in the same genus as the striped newt). Drought conditions are predicted to be more severe and longer in the coming years. As drought (see discussion under Factor E below) and loss of habitat (see discussion under Factor A above) continue to act as stressors, striped newt populations may become more susceptible to disease outbreaks, which could potentially result in some localized population extinctions, as has occurred with similar species. Because, from the best available information, we do not know if disease is currently affecting the striped newt populations, but we believe it is likely that it will in the coming decades, we consider this threat to be nonimminent. Since disease has resulted in loss to similar amphibian species, and additional stressors (e.g., habitat loss, drought, and climate change) might make some populations of striped newts more vulnerable to disease, the magnitude of this threat is moderate. Based upon our review of the best commercial and scientific data available, we conclude that disease is a nonimminent threat of moderate magnitude to the striped newt within the foreseeable future.

D. The inadequacy of existing regulatory mechanisms:

There is currently little Federal and State protection of isolated wetland habitat and surrounding upland habitats. While many States in the southeastern United States do not regulate those activities affecting wetlands that are exempt from section 404 of the Federal Clean Water Act (CWA) (33 U.S.C.1251 et seq.), Florida is the only State known to regulate isolated wetlands. In Georgia, there are no State laws that protect isolated wetlands. Lack of protection for upland habitat under wetland statutes can result in loss of recruitment of efts and paedomorphs into the breeding adult population, which would reduce the potential for the population to persist (Semlitsch 1998, p. 1116).

Federal Statutes and Regulations

The CWA regulates the dredge and fill activities that adversely affect wetlands. Section 404 of

CWA regulates the discharge of dredge or fill materials into wetlands. Discharges are commonly associated with projects to create dry land for development sites, water-control projects, and land clearing. The U.S. Army Corps of Engineers (COE) and the U.S. Environmental Protection Agency (EPA) share the responsibility for implementing the permitting program under section 404 of the CWA. EPA and COE provided a guidance memorandum for implementing recent court cases addressing jurisdiction over waters of the United States under the CWA, specifically addressing the term “navigable waters” (EPA and COE 2001, pp. 1–7; EPA and COE 2008, pp. 1–13). It is clear from this guidance that isolated wetlands are not considered waters of the United States under the “navigable waters” definition and thus are not provided protection under the CWA. Further wetland regulations are reviewed by the COE for the development of wetlands less than 1.2 ha (3 ac) under a permit called Nationwide Permit 26 (Kirkman et al. 1999, p. 553; Snodgrass et al. 2000, p. 415).

The Department of the Interior, through the Service, administers the National Wildlife Refuge System. The National Wildlife Refuge System Administration Act of 1966 (NWRAA; 16 U.S.C. 668dd-668ee) provides legislation for the administration of a national network of lands and water for the conservation, management, and restoration of fish, wildlife, and plant resources and their habitats for the benefit of the American people. Amendment of the NWRAA in 1997 requires the refuge system to ensure that the biological integrity, diversity, and environmental health of refuges be maintained and requires development and implementation of a comprehensive conservation plan (CCP) for each refuge. The CCP must identify and describe the wildlife and related habitats in the refuge and actions needed to correct significant problems that may adversely affect wildlife populations and habitat (16 U.S.C. 668dd(e)). Striped newt habitat within national wildlife refuges is protected from loss due to urban development. Striped newts have historically been observed at St. Marks National Wildlife Refuge (SMNWR) in Florida and Okefenokee National Wildlife Refuge (ONWR) in Georgia. Striped newts were historically found at ONWR in the 1920s, but the only known breeding pond was last occupied by newts in 1994. Aicher (ONWR, personal communication, September 14, 2010) has not found striped newts at ONWR, even though this breeding pond is still in good condition with well-maintained uplands surrounding it. The breeding pond at ONWR was sampled in May 2013 by John Jensen and Dirk Stevenson, but no striped newts were found (J. Smithem, personal observation, 2013). At SMNWR, surveys conducted in 2002–2005 and again in 2009 were not able to locate any newts at 34 ponds (K. Enge, FWC, personal communication, 2010; Dodd et al. 2007, p. 29). The last known observation was in 1978, but now the habitat appears to be too degraded to be suitable for striped newts due to the lack of fire. Striped newts may indirectly benefit from fire management programs intended to maintain and restore habitat for species such as the red cockaded woodpecker (Picoides borealis) and gopher tortoise (Gopherus polyphemus), but no systematic monitoring programs are in place to evaluate striped newt responses to land management activities within the refuge system.

On military installations, the Department of Defense (DOD) must conserve and maintain native ecosystems, viable wildlife populations, Federal and State listed species, and habitats as vital elements of its natural resource management programs, to the extent these requirements are consistent with the military mission (DOD Instruction 4715.3). Amendments to the Sikes Act (16 U.S.C. 670 et seq.) require each military department to prepare and implement an integrated natural resources management plan (INRMP) for each installation under its jurisdiction. The INRMP must be prepared in cooperation with the Service and State fish and wildlife agencies, and must reflect the mutual agreement of these parties concerning conservation, protection, and management of wildlife resources (16 U.S.C. 670a). Each INRMP must provide for wildlife, land and forest management, wildlife-oriented recreation, wildlife habitat enhancement, wetland protection, sustainable public use of natural resources that are not inconsistent with the needs of wildlife resources, and enforcement of natural resource laws (16 U.S.C 670a). DOD regulations mandate that resources and expertise needed to establish and implement an integrated natural resources management program are maintained (DOD Instruction 4715.3). These regulations further define the INRMP requirements, and mandate that plans be revised every 5 years and that they ensure the military lands suitable for management of wildlife are actually managed to conserve wildlife resources (DOD Instruction 4715.3).

The effectiveness of individual INRMPs to protect striped newts vary between and within military departments. Because the striped newt is not a protected species in Florida, the INRMP for Camp Blanding Military Installation does not specifically address management programs for this species. However, management activities that benefit the red-cockaded woodpecker and gopher tortoise, such as prescribed burning, should also benefit the striped newt. The striped newt is listed as threatened by the State of Georgia, so the INRMP for Fort Stewart Range and Garrison does address the specific conservation and management of this species.

The Navy does incorporate protective ecosystem management into INRMPs for Naval Air Station Jacksonville (and associated Rodman Bombing Range, Pinecastle Range, and Outlying Landing Field Whitehouse), Naval Station Mayport, and Naval Submarine Base Kings Bay. However, the INRMPs do not include specific management measures for the striped newt.

The Forest and Rangeland Renewable Resources Planning Act (16 U.S.C. 36), of 1974, as amended by the National Forest Management Act of 1976 (16 U.S.C. 1600 et seq.), requires that each national forest be managed under a forest plan which must be revised every 10 years. Regulations governing preparation of forest plans are found in 36 CFR 219. The purpose of a forest plan is to provide an integrated framework for analyzing and approving future, site-specific projects and programs, including conservation of listed species. Identification and implementation of land management and conservation measures to benefit striped newts vary between forests. For example, on the National Forests in Florida, striped newts are not designated as a species for which special management prescriptions are implemented. There are no specific land management objectives for striped newts on the National Forests in Florida. The Land and Resource Management Plan for the National Forests in Florida (U.S. Forest Service 1999, entire) provides for the restoration of longleaf pine forest through various management areas located at Apalachicola National Forest (ANF) and Ocala National Forest (ONF). Metapopulations of striped newts are found at both of these forests. However, a decline of striped newt populations at ANF has occurred over the past 10 years (Means et al. 2008, p. 6) to a point where extirpation from this area is determined likely by CPI researchers (Means et al. 2012, p.14).

State Statutes and Regulations

Generally, State statutes and regulations protect striped newts from take, but the effectiveness and implementation of regulations vary between States. The striped newt is not currently a State-listed species in Florida. However, the ephemeral ponds in Florida have some protection under Florida State regulations. The five Water Management Districts (WMDs) and the Florida Department of Environmental Protection (FDEP) regulate wetland protection. The WMDs include isolated wetlands in the Environmental Resource Permit process, which requires a permit for any activities that would impact a wetland (SJRWMD 2010, p. 1). Under the WMDs permitting process, mitigation for impacts to wetlands below a minimum permitting threshold size of 0.2 ha (0.5 ac) is not addressed unless the wetland supports an endangered or threatened species, is connected by standing or flowing surface water at seasonal high water level to one or more wetlands that total more than 0.2 ha (0.5 ac), or is of more than minimal value to fish and wildlife (SJRWMD 2010, p. 1). This minimum permitting threshold size was adopted by the WMD, “based on consensus of scientific and regulatory opinions rather than on biological and hydrological evidence” (Hart and Newman 1995, p. 4). However, under Florida Statue Title XXVIII Chapter 371.406, agriculture (which includes silviculture) has exemptions to alter topography unless it is for the sole purpose of impounding or obstructing surface waters.

The size of the wetland is primarily how the State of Florida and the COE address wetland regulations. Snodgrass et al. (2000, p. 415) found that wetland values were based on four assumptions: (1) that small wetlands are ephemeral; (2) because wetlands are ephemeral, they support few species; (3) species supported by small wetlands are also found in large wetlands; and (4) populations found in individual wetlands are independent from other wetlands. Snodgrass et al. (2000 p. 219) concluded that these assumptions are not accurate and that there is no relationship between wetland size and species richness. Instead, wetland regulations should include a diversity of hydroperiods and connectedness of wetlands (Snodgrass et al. 2000, p. 219).

Enge et al. (2014a, p. 57) found that striped newt breeding ponds in Florida (n =124) ranged in size from 0.02 to 12.22 ha, with a mean size of 1.01 ± 1.55 ha and a median size of 0.48 ha. Striped newt ponds in the Florida panhandle had a mean size of 0.37 ha, which is significantly smaller than breeding ponds in the peninsula, which had a mean size of 1.12 ha (Enge et al. 2014a, p.57). Protecting these small wetlands will help maintain biodiversity with respect to the number of plant, invertebrate, and vertebrate species, including striped newts (Moler and Franz 1987, pp. 236–237). The loss of these small, ephemeral wetlands changes the metapopulation dynamics of striped newts by reducing the number of individuals that can disperse and reproduce successfully, and by increasing the dispersal distance among wetlands (Semlitsch and Bodie 1998, p. 1131). The reduction in wetland densities decreases the probability that populations can be recovered by adjacent source populations, due to greater distances between wetlands, which eventually leads to population extinctions (Gibbs 1993, pp. 25–26; Semlitsch and Bodie 1998, pp.1131–1132). This makes it important to not only consider local and regional wetland distribution in wetland regulations, but also the protection of the surrounding non-breeding uplands, in which the newts complete their metamorphosis from efts to adults, and from which the adults emigrate back to the breeding ponds.

In Georgia, a State statute requires that any rule and regulation promulgated for protected species (including the striped newt) shall not affect rights on private property or in public or private streams, nor shall such rules and regulations impede construction of any type (Ga. Code Ann. section 27-3-132(b)). Georgia's Endangered Wildlife Act of 1973 establishes statutory protection for protected species (Ga. Code Ann. section 27-3-130–133). Georgia Board of Natural Resources Rule (Chapter 391-4-10) mirrors the statue, but includes permitting for research under a scientific collecting permit (Ga. Code Ann. section 27-2-12). Any implementing regulations are constrained by these statutory requirements, and therefore can only prohibit collection, killing, or selling of individual newts. There are no regulatory or permitting mechanisms in place in Georgia to address habitat destruction or striped newt mortality resulting from development projects on private lands. Consequently, striped newts and their habitat in private ownership in Georgia are vulnerable to ongoing and future habitat loss and mortality.

Local Laws and Ordinances

Florida's State Comprehensive Plan and Growth Management Act of 1985 (F.A.C. 163 Part II) requires each county to develop local comprehensive planning documents. Comprehensive plans contain policy statements and natural resource protection objectives, including protection of State and federally listed species, but they are only effective if counties develop, implement, and enforce ordinances. Some Florida county governments have developed protective ordinances for State and federally listed species, but all such ordinances are based on compliance with the State or Federal law, rather than enacting more stringent local laws. Consequently, Florida's local governments provide no additional protection to striped newts. We are aware of no county or local regulations or ordinances that protect the striped newt beyond existing State law in Georgia.

Summary of Factor D

Current Federal, State, and local regulations do not protect the vast majority of striped newts or their habitat on private lands. In Georgia, striped newt habitats on private lands are not protected under State regulations, even though the striped newt is listed as threatened in that State. The status of striped newts on private lands is unknown, but is likely threatened by ongoing land uses, such as development and silviculture. Regulatory mechanisms at the local, State, and Federal levels provide varying degrees of protection to wetlands, but do not protect the small, ephemeral wetlands that striped newts use for breeding sites. Many regulations do not address management needs of the striped newt. We find that existing regulatory mechanisms are insufficient to reduce or remove threats to striped newts on public and private lands, including wetlands that may support striped newt populations, and we therefore find that the inadequacy of existing regulatory mechanisms is an imminent threat to this species throughout all of its range, as it is occurring now and not expected to change in the near future. This threat is pervasive throughout the species' entire range, so the magnitude of this threat is moderate. Therefore, based on our review of the best available scientific and commercial information, we conclude that the inadequacy of existing regulatory mechanisms is an imminent threat of moderate magnitude to the striped newt, both now and in the foreseeable future.

E. Other natural or manmade factors affecting its continued existence:

The effects of a long-term drought have contributed to the decline of striped newts from breeding ponds at not only the Munson Sandhills of the ANF in Florida, but at breeding sites throughout Florida and Georgia. Droughts normally occur in cycles and amphibian populations fluctuate with drought conditions (Dodd 1992, pp. 138–139). However, droughts lasting several years (more than 4) were found to have affected reproductive success, resulting in population decline (Dodd 1992, p. 139; Dodd and Johnson 2007, p. 150; Petranka 1998, p. 450). Surveys conducted at the Camp Blanding Joint Training Center in 2000 to 2001, during a drought, did not find any striped newts, due to dry breeding ponds. In previous years, surveys found 7 to 10 sites with newts (Gregory et al. 2006, p. 487). Striped newts will respond to drought conditions in several ways: (1) temporary extirpation; (2) migration to adjacent areas with better habitat conditions; and (3) survival in upland habitat, with recolonization once water has returned (Dodd 1993, p. 612).

Even with the return of water at the Munson Sandhills in ANF, striped newt populations have not recovered (R. Means, CPI, personal communication, 2013). Although droughts are a naturally occurring event in the ecology of the striped newt, prolonged droughts can worsen threats to already small populations, and exacerbate the degradation and fragmentation of striped newt habitat that is already taking place (discussed under Factor A above), leading to extinction of striped newts in many areas.

We expect climate change will result in the loss and degradation of striped newt habitat in the future, particularly in Florida. According to the Intergovernmental Panel on Climate Change Synthesis Report (IPCC 2007, p. 2), warming of the earth's climate is "unequivocal," as is now evident from observations of increases in average global air and ocean temperatures, widespread melting of snow and ice, and rising sea level. Temperatures are predicted to rise from 2.0 degrees Celsius (oC) to 5.0 oC (3.6 degrees Fahrenheit (°F) to 9.0 °F) for North America by the end of this century (IPCC 2007, p. 9). The IPCC report (2007, pp. 2, 6) outlines several scenarios that are virtually certain or very likely to occur in the next 50 years, including: (1) Over most land, there will be fewer cold days and nights, and warmer and more frequent hot days and nights; (2) Areas affected by drought will increase; and (3) The frequency of heavy precipitation events over most land areas will likely increase. The Southeastern United States is predicted to experience more severe and longer droughts. Other processes to be affected by this projected warming include rainfall (amount, seasonal timing, and distribution), storms (frequency and intensity), and sea level rise. Enge et al. (2014a, pp. 69-76) examined local weather station data in Florida and found that air temperatures in the Florida peninsula had increased significantly over the last 120 years and that these temperature increases were associated with longer droughts in the north central and south central regions of the peninsula, which are within the range of the striped newt.

Indirect impacts are expected due to the relocation of people from flood-prone urban areas to inland areas (Ruppert et al. 2008, p. 127), including the relocation of millions of people to currently undeveloped interior natural areas (Stanton and Ackerman 2007, p. 15). Others have proposed implementation of a large-scale systematic translocation of at-risk human populations to interior locations (Gilkey 2008, pp. 9–12). Florida's interior natural ecological communities will likely be impacted by the increasing need of urban infrastructure to support retreating coastal inhabitants. While available data are not adequately specific to evaluate the potential direct effects of predicted climate changes on the striped newt or provide information on just how much habitat may be lost, any habitat loss related to climate change would be in addition to the 20 percent loss projected to occur by 2060 due solely to people moving into Florida (FWC 2008, p. 2).

Summary of Factor E

We have identified that long-term droughts have resulted in the loss of striped newt breeding ponds, exacerbating existing population fluctuations and causing local extinctions. This threat is ongoing and is expected to continue in the future, especially because threats to habitat continue to affect existing striped newt populations and may make them more susceptible to potential population extinction. On the basis of this analysis, we find that the natural factor of long-term droughts is currently a threat and is expected to persist, and possibly escalate in the future, as a result of climate change, although climate change itself is not an imminent threat. Because we expect this threat to continue to occur over the coming decades, we consider the threat to be imminent. Throughout the entire range of the striped newt, droughts are predicted to be more severe and longer in duration in the coming years, so we believe the magnitude of this threat is high. Based upon our review of the best commercial and scientific data available, we conclude that other natural or manmade factors affecting the species' continued existence is an imminent threat of high magnitude to the striped newt, both now and in the foreseeable future.

Conservation Measures Planned or Implemented :

Conservation Efforts to Increase Adequacy of Existing Regulations

As we indicated above, the inadequacies of existing regulations are inextricably linked to threats associated with the present or threatened destruction, modification, or curtailment of the striped newt's habitat or range, explained under Factor A above. However, the U.S. Forest Service (USFS) has now restricted or closed ORV use in sensitive biological communities, such as wetlands (USFS 2010, p. 1), at both ANF and ONF. ORVs have historically been a recurring issue in or around ponds at ANF and ONF. However, recent changes at ANF and ONF have made ORVs off-limits in the Munson Sandhills and the ephemeral ponds in the ONF where striped newt ponds were being affected by ORV use (C. Petrick, USFS, personal communication, 2006).

Conservation Efforts to Repatriate the Striped Newt to Apalachicola National Forest

The Coastal Plains Institute (CPI) and U.S. Forest Service entered a 5-year cost-share agreement in October 2010 to address the severe decline of the striped newt population on the ANF (Means et al. 2011, p. 2). The study objectives are to couple striped newt repatriation with precautionary habitat measures to ensure repatriation success and enhance breeding habitat on ANF. Repatriation at multiple wetland breeding sites is expected to boost the ANF striped newt population and provide new management strategies for similarly imperiled amphibian species (Means et al. 2011, p. 2).

In 2011, 21 western clade striped newt larvae, genetically similar to ANF striped newts, were collected in Year 1 from the Fall Line Sandhills Wildlife Management Area in Georgia (Means et al.

2012, p. 9). These animals became the parental generation that started a captive assurance colony at the Memphis Zoo in Tennessee. Although at one time there were 545 F1 larvae from the parental animals, that number dropped to only about 45 F1 larvae due to an unknown population crash (Means et al. 2012, p. 18). All parentals remained healthy. In early May 2013, CPI captured 12 more wild striped newt larvae from the original source wetland within the Fall Line Sandhills Natural Area, Georgia, to boost genetic robustness of the original zoo captive population of founder individuals captured in 2011 (Means et al. 2013, p. 16). The captive western striped newt colony continues to serve two important roles: 1) it is the first assurance colony ever created for the highly imperiled western genetic variant of the striped newt and serves important conservation needs, and 2) larvae produced from this colony are being utilized for the study's repatriation efforts (Means et al. 2013, p. 16).

Due to lack of a geological confining layer underneath the study area wetlands and on-going drought, CPI also investigated the use of habitat enhancement techniques to ensure recipient wetlands do not go dry during the critical larval repatriation periods. In 2011, CPI determined that wetlands augmentation using local groundwater would not be a feasible tool to avoid pond-drying for a variety of reasons (Means et al. 2011, p. 15). In 2012, pond liners were investigated and found to be more effective at extending pond hydroperiods (Means et al. 2012, p. 20) and were installed underneath three of the four selected repatriation wetlands (Means et al. 2013, p. 7). Installing pond liners in the wetland study areas may be a key precautionary measure for ensuring success of repatriations. Observational water presence/absence data collected since their installation in 2012 preliminarily suggest that liners have been effective at extending pond hydroperiods. Furthermore, all liner-enhanced wetlands currently appear to be ecologically healthy and vegetatively diverse, and contain up to five species of larval amphibians at any given time (Means et al. 2013, p. 19; Means et al. 2014, p. 24).

The first repatriation attempt of larval striped newts into the study area occurred in Year 3 of the study. On May 1, 2013, 58 larvae were introduced into a single repatriation wetland (Pond 16) into four predator-free screen enclosures (Means et al. 2013, p. 9). Larvae remained in enclosures for 2-4 weeks depending upon rapidly lowering pond water levels. Enclosures were dipnetted periodically to monitor larval development, but few were observed. Those that were observed exhibited rapid growth (Means et al. 2013, p. 21). All enclosures were opened after 4 weeks due to pond drying (Means et al. 2013, p. 22).

An encircling drift fence was then constructed around the repatriation wetland (Pond 16) to measure any outgoing terrestrial efts (Means et al. 2013, p. 10). Three terrestrial efts were detected exiting the pond in late June-July 2013, signifying the first three terrestrial striped newt efts produced in the repatriation study (Means et al. 2013, p. 22). Heavy and frequent rain fell in July and August 2013. The drift fence flooded and was terminated in late July 2013, nearly three months after repatriation (Means et al. 2013, p. 24). Although the wetland was periodically dipnetted and seined afterward to continue to measure for newt occupation, no more newts were observed. This finding may either reflect a die-off of the rest of the repatriated newt population or may reflect a dilution effect of wetland flooding. Year 3's monitoring after repatriation concluded on August 20, 2013 (Means et al. 2013, p. 24).

In Year 4 of the study, encircling drift fences were constructed around the remaining three repatriation wetlands (Pond 18, Pond 75, and Pond 182) because higher numbers of striped newt larvae were available for release (Means et al. 2014, p. 12). Between February and July 2014, CPI released 433 larvae (both at large and within newly-designed predator-free box enclosures) during several separate events into all four recipient wetlands. A total of 32 newly-metamorphosed, terrestrial efts were observed exiting the recipient wetlands (Means et al. 2014, p. 16). Due to the drift fences flooding during the prime metamorphosis periods, as also witnessed during 2013, it is likely that that some metamorphosing efts may have trespassed over the top of our flooded fences. Therefore, actual numbers of terrestrial efts exiting the recipient wetlands were likely higher than documented yields at all sites (Means et al. 2014, p. 20).

Summary of Threats :

This status review identified threats to the striped newt attributable to Factors A, C, D, and E. The primary threats to the striped newt are habitat loss, disease, inadequate regulatory mechanisms, and drought. Habitat destruction and modification (Factor A) in the form of conversion of native longleaf pine forests to intensively managed pine forests and urban development are occurring on private lands throughout the range. Disease (Factor C) is expected to become more problematic for striped newts as additional habitat is lost and fragmentation increases. Stressors such as habitat loss (Factor A) and droughts (Factor E) are expected to elevate risks of diseases in newts because this has been the case with similar species. Regulatory mechanisms are inadequate to prevent further loss of breeding ponds on private lands (Factor D) throughout the striped newt's range. Existing regulations also do not protect striped newts on private lands in Florida and Georgia. Long-term regional droughts in Florida and Georgia (Factor E) have a negative impact on the long-term persistence of striped newts.

Since 1994, the striped newt has been monitored at 20 of the best breeding ponds on ANF (R. Means, CPI, personal communication, 2013; Means and Means 1998a., pp. 9–25; Means et al. 1994, pp. 14–24; Means et al. 2008, p. 6). Since 1999, severe drought conditions were experienced at these ponds, and newts were shown to be declining. However, despite improving conditions at these ponds during 2009-2010, no striped newts were located in 2010 (Means et al. 2012, p.14). More recent sampling efforts, with the same negative results, have led CPI biologists to believe that the striped newt is currently extirpated from this area (Means et al. 2012, p.14). The precipitous apparent declines at ANF could occur elsewhere on protected lands within the striped newt's range, despite the protection of habitat (Factor E). This suggests that perhaps other threats (e.g., disease and drought) may continue to act on the species at these sites. Drought conditions are predicted to be more severe and longer in the coming years. As described under Factor C, drought and other factors continue to act as stressors on existing striped newt populations and may make them more susceptible to disease outbreaks and may result in the population extinction of some metapopulations. There has not been any evidence of disease at other large metapopulations, such as ONF.

For species that are being removed from candidate status:

__No__ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

• Maintain metapopulation dynamics (Johnson 2005).
• Preserve upland links among an assortment of potential breeding ponds on the landscape (Enge 2011).
• Preserve a variety of wetlands with different hydroperiods (Enge 2011).
• Conduct frequent prescribed fires in sandhill communities to control hardwood encroachment of uplands and shrub invasion and peat buildup in wetlands (Enge 2011).
• Continue to monitor populations on lands that are considered strongholds for the newt, as well as lands with only one or two known breeding ponds.
• Further investigate the implications of Batrachochytrium dendrobatidis and Ranavirus in striped newt populations.
• Further investigate the need for repatriation of locations throughout the newt’s range, particularly in western regions, to increase population numbers (Means et al. 2012).

Description of Monitoring:

The most recent wide-scale monitoring effort was conducted by the Florida Fish and Wildlife Conservation Commission from July 2008 to June 2014 (Enge 2011, Enge et al. 2014a). From 2008-2011, the Striped Newt Survey Team surveyed 714 ponds on 38 public conservation lands and on two private lands (Enge 2011, p. 1). A total of 1,179 unique ponds was surveyed in 2011−14 on 121 conservation lands and 21 private lands (Enge et al. 2014a, pp. 130−133), but many of these ponds were not located in suitable striped newt habitat or were outside the species’ range. Smaller-scaled survey efforts continue to be conducted by researchers throughout the species range and will be reported as appropriate.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Florida,Georgia

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

On August 30, 2012, a meeting was held in Gainesville, Florida, to discuss striped newt conservation efforts. Two biologists from the Service and five biologists from FWC participated in the meeting (GADNR biologists provided comments at a later date). Topics of discussion included current threats to the species, the possibility of developing CCAs or CCAAs for the newt, current land management practices near striped newt habitat, and outstanding research questions that need to be answered. Five action items resulted from the meeting and will be addressed as time and resources permit.

In addition to the meeting in August 2012, the following individuals reviewed this year's species assessment form for the striped newt and provided comments:

Florida (Kevin Enge and Anna Farmer, Florida Fish and Wildlife Conservation Commission)
Georgia (John Jensen, Georgia Department of Natural Resources)
Coastal Plains Institute and Land Conservancy (Ryan Means)

Literature Cited:

Blaustein, A.R., and P.T.J. Johnson. 2003. The complexity of deformed amphibians. Frontiers in Ecology 1(2):87-94.

Center for Quality Growth and Regional Development. 2006. Georgia coast 2030: population projections for the 10-county coastal region. Georgia Institute of Technology. 103 pgs.

Christman, S.P. and R. Franz. 1973. Feeding habits of the striped newt, Notophthalmus perstriatus. Journal of Herpetology 7(2):133-135.

Christman, S. P. and D. B. Means. 1992. Rare striped newt, Notophthalmus perstriatus. Pgs. 62-65 in: P. E. Moler (ed.). Rare and endangered biota of Florida. Vol. III. Amphibians and Reptiles. University Press of Florida, Gainesville, Florida.

Cook, J. 2008. Telephone interview between Linda LaClarie, U.S. Fish and Wildlife Service, and Josh Cook, University of Georgia, Athens, Georgia, regarding "perkinsus-like" disease found in captive striped newt. May 22, 2008.

Daszak, P., D.E. Scott, A.M. Kilpatrick, C. Faggioni, J.W. Gibbons, and D. Porter. 2005. Amphibian population decline at Savannah River site are linked to climate, not Chytridiomycosis. Ecology 86(12):3232-3237.

Dodd, C.K., Jr. 1992. Biological diversity of a temporary pond herpetofauna in north Florida sandhills. Biodiversity and Conservation 1:125-142.

Dodd, C.K., Jr. 1993. Cost of living in an unpredictable environment: the ecology of striped newts, Notophthalmus perstriatus, during a prolonged drought. Copeia 3:605-614.

Dodd, C.K., Jr., 1995a. The rare newt of Trail Ridge. Reptile and Amphibian Magazine, July/August Issue. Pp. 36-45.

Dodd, C.K., Jr. 1995b. Reptiles and amphibian in the endangered longleaf pine ecosystems. Pgs. 129-131 in E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, and M.J. Mac (eds.). Our living resources: A report to the nation on the distribution, abundance, and health of U.S. plants, animals, and ecosystems. U.S. Department of Interior- National Biological Service, Washington, DC.

Dodd, C. K., Jr. 1996. Use of terrestrial habitats by amphibians in the sandhill uplands of north central Florida. Alytes 14(1): 42-52.

Dodd, C.K., Jr. and B.S. Cade. 1998. Movement patterns and the conservation of amphibian breeding in small, temporary wetlands. Conservation Biology 12(2):331-339.

Dodd, C.K., Jr. and B.G. Charest. 1988. The Herpetofaunal community of temporary ponds in north Florida sandhills: Species composition, temporal use, and management implications. Pgs. 87-97 in. R.C. Szaro, K.E. Severson, and D.R. Patton (eds.). Management of Amphibians, Reptiles, and Small Mammals in North America. U.S. Department of Agriculture, Forest Service, General Technical Report RM-166.

Dodd, C. K., Jr. and S.A. Johnson. 2007. Breeding ponds colonized by striped newts after 10 or more years. Herpetological Review 38:150-152.

Dodd, C. K., Jr. and L. V. LaClaire. 1995. Biogeography and status of the striped newt (Notophthalmus perstriatus) in Georgia. Herpetological Natural History 3:37-46.

Dodd, C.K., Jr., W. Barichivich, S. Johnson, and J. Staiger. 2007. Changes in a northwestern Florida gulf coast herpetofaunal community over a 28-year period. The American Midland Naturalist 158:29-48.

Dodd, C. K., Jr., S. A. Johnson, D. B. Means. 2005. Notophthalmus perstriatus. Pgs. 887-889 in: M. Lannoo (ed). Amphibian declines: the conservation status of United States species. University of California Press, Berkeley, California.

Endries, M., B. Stys, G. Mohr, G. Kratimenos, S. Langley, K. Root, and R. Kautz. 2009. Wildlife Habitat Conservation Needs in Florida. Fish and Wildlife Research Institute Technical Report TR-15. 191 pgs.

Enge, K.M. 2010. Letter from Florida Fish and Wildlife Conservation Commission to U.S. Fish and Wildlife Service providing information on the 90-day finding to list the striped newt. May 24, 2010.

Enge, K.M. 2011. Statewide survey for the striped newt. Final Report. Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Wildlife Research Section, Gainesville, Florida. 41 pp.

Enge, K. M., A. L. Farmer, J. D. Mays, T. D. Castellón, E. P. Hill, and P. E. Moler. 2014a. Survey of winter-breeding amphibian species. Final Report. Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Lovett E. Williams, Jr. Wildlife Research Laboratory, Gainesville, Florida. 136 pp.

Enge, K. M., J. D. Mays, and J. C. Blush. 2014b. Geographic distribution: Notophthalmus perstriatus (striped newt). Herpetological Review 45:275.

Florida Department of Environmental Protection. 2007. http://dep/state.fl.us/lands/stewardship.html. Accessed February 22, 2010.

Florida Fish and Wildlife Conservation Commission. 2008. Wildlife 2060: what's at stake for Florida. Tallahassee, Florida.

Franz, R. and L. L. Smith. 1999. Distribution and status of the striped newt and Florida gopher frog in peninsular Florida. Final Report of Project NG90-035 submitted to the Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program. 46 pgs.

Frost, C. 2006. History and future of the longleaf pine ecosystems. Pgs. 9-39 in S. Jose, E. Jokela, and D. Miller (eds.). The longleaf pine ecosystem: ecology, management, and restoration. Springer Science and Business Media, New York, New York.

Gibbs, J.P. 1993. Importance of small wetlands for the persistence of local populations of local populations of wetland-associated animals. Wetlands 13(1):25-31.

Gilkey, D. E. 2008. A case for inland population settlement in Florida. Unpublished report Gilkey Organization, LLC. On file, U.S. Fish and Wildlife Service, Jacksonville, Florida.

Gray, M.J., D. Miller, and J. Hoverman. 2009a. Ecology and pathology of amphibian ranaviruses. Disease of Aquatic Organisms 87:243-266.

Gray, M.J., J. Hoverman, and D. Miller. 2009b. Amphibian ranaviruses in the Southeastern U.S. Southeastern Partners in Amphibian and Reptile Conservation, Disease, Pathogens and Parasites Task Team. Information Sheet #1.

Green, D.M., K. Converse, and A. Schrader. 2002. Epizootiology of sixty-four amphibian morbidity and mortality events in the U.S.A, 1996-2001. Annals New York Academy of Sciences 969:323-339.

Green D. M. 2003. The ecology of extinction: population fluctuation and decline in amphibians. Biological Conservation 111:331-343.

Gregory, C.J., R.R. Carthy, and L.G. Pearlstine. 2006. Survey and monitoring of species at risk at Camp Blanding Training Site, northeastern Florida. Naturalist 5(3):473-498.

Hart R. and J.R. Newman. 1995. The importance of isolated wetlands to fish and wildlife in Florida. Florida Game and Freshwater Fish Commission, Nongame Wildlife Program Project Report. 145 pgs.

Hoffman, E.A. 2012. Population genetic structure and effective population size in the striped newt (Notophthalmus perstriatus). Report, Department of Biology, University of Central Florida, Orlando, Florida. 41 pp.

Howell, W. B. Malloy and G. Brock. 2003. Land management review team findings: 1997-2003. Florida Department of Environmental Protection, Tallahassee, Florida.

Jensen, J. 2010. Email received from John Jensen, Georgia Department of Natural Resources, Georgia, to Annie Dziergowski, U.S. Fish and Wildlife Service, Jacksonville, Florida, regarding the current status of striped newts in Georgia. September 14, 2010.

Jensen, J. 2013. Email received from John Jensen, Georgia Department of Natural Resources, Georgia, to Jodie Smithem, U.S. Fish and Wildlife Service, Jacksonville, Florida, providing comments on the draft species assessment form for the striped newt. April 8, 2013.

Jensen, J. 2014. Email received from John Jensen, Georgia Department of Natural Resources, Georgia, to Jodie Smithem, U.S. Fish and Wildlife Service, Jacksonville, Florida, providing comments on the draft species assessment form for the striped newt. April 15, 2014.

Jensen, J.B., and N.A. Klaus. 2004. Notophthalmus perstriatus (Striped Newt) Geographic distribution. Herpetological Review 35:403.

Johnson, S.A. 2001. Life history, ecology, and conservation genetics of the striped newt (Notophthalmus perstriatus) [PhD Dissertation]. University of Florida, Gainesville, Florida. 168 pgs.

Johnson, S. A. 2002. Life history of the striped newt at a north-central Florida breeding pond. Southeastern Naturalist 1(4):381-402.

Johnson, S. A. 2003. Orientation and migration distances of a pond-breeding salamander (Salamandridae, Notophthalmus perstriatus). Alytes 21:3-22.

Johnson, S. A. 2005. Conservation and life history of the striped newt: the importance of habitat connectivity. Pgs. 91-98 in: W. E. Meshaka, Jr. and K. J. Babbitt (eds.). Amphibians and reptiles: status and conservation in Florida. Krieger, Malabar, Florida.

Johnson, S. A., and R. D. Owen. 2005. Status of historical striped newt (Notophthalmus perstriatus) locations in peninsular Florida and some “new” locations. Unpublished report submitted to U.S. Fish and Wildlife Service, Jackson, Mississippi. 67 pp.

Intergovernmental Panel on Climate Change. 2007. Climate change 2007: a synthesis report, summary for policymakers.

LaClaire, L.V. 1995. Vegetation of selected upland temporary ponds in north and north-central Florida. Bulletin Florida Museum of Natural History 38(1):69-96.

LaClaire, L.V. and R. Franz. 1990. Importance of isolated wetlands in upland landscapes. Pgs. 9-15 in M. Kelly (ed.). Proceedings 2nd Annual Meeting, Florida Lake Management Society. Winter Haven, Florida.

LaClarie, L.V., R. Smith, S. Smith, and J. Palis. 1995. Geographic distribution: Notophthalmus perstriatus (striped newt). Herpetological Review 26(2):103-104.

Marsh, D.M. and P.C. Trenham. 2001. Metapopulation dynamics and amphibian conservation. Conservation Biology 15:40-49.

May, S. E., K. A. Medley, S. A. Johnson, and E. A. Hoffman. 2011. Combining genetic structure and ecological niche modeling to establish units of conservation: a case study of an imperiled salamander. Biological Conservation 144:1441−1450.

Mays, J. D., and K. M. Enge. 2014. Geographic distribution: Notophthalmus perstriatus (striped newt). Herpetological Review 45:275.

Means, D.B. 1996. A preliminary consideration of highway impacts on herpetofauna inhabiting small, isolated wetlands in the southeastern U.S. Coastal Plain. Pgs. 1-11 in G.L. Evink, P. Garrett, D. Zeigler, and J. Berry (eds.). Trends in Addressing Transportation Related Wildlife Mortality. Proceedings of the Transportation Related Wildlife Mortality Seminar, April 30- May 2, 1996, Orlando Florida. Florida Department of Transporation, Tallahassee.

Means, D.B. 2001. Reducing impacts of rare vertebrate that require small isolated water bodies along U.S. Highway 319. Final Report to Florida Department of Transportation, Tallahassee. 142 pgs.

Means, D.B. 2003. Results of the drift fence survey of study pond #1: Apalachicola National Forest, Leon County, Florida June 2002-2003. Final Report to U.S. Fish and Wildlife Service, Jackson, MS. 23 pgs.

Means, D. B. 2006. Vertebrate faunal diversity in longleaf pine savannas. Pgs. 157-213 in: S. Jose, E. Jokela, and D. Miller (eds.). Longleaf pine ecosystems: ecology, management, and restoration. Springer-Verlag, New York, New York.

Means, R. 2008. Management strategies for Florida's ephemeral ponds and pond-breeding amphibians. Final Report to Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida. 108 pgs.

Means, R. 2013. Email received from Ryan Means, Coastal Plains Institute and Land Conservancy, Tallahassee, Florida, to Jodie Smithem, U.S. Fish and Wildlife Service, Jacksonville, Florida, providing comments on the draft species assessment form for the striped newt. April 16, 2013.

Means, D.B. and R.C. Means. 1998a. Distribution of the striped newt (Notophthalmus perstriatus) and gopher frog (Rana capito) in the Munson Sandhills of the Florida panhandle. Report to the U.S. Fish and Wildlife Service, Jackson, MS.

Means, D.B. and R.C. Means. 1998b. Red Hills survey for breeding pond habitat for the flatwoods salamander (Ambystoma cingulatum), gopher frog (Rana capito), and striped newt (Notophthalmus perstriatus) in the Tallahassee Red Hills of Leon, Gadsen, and Jefferson Counties, Florida, and the

Tifton Uplands of Thomas and Grady Counties, Georgia. Report to the U.S. Fish and Wildlife Service, Jackson, MS.

Means, D. B. and R. C. Means. 2005. Chapter 7. Effects of sand pine silviculture on pond-breeding amphibians in the Woodville Karst Plain of north Florida. Pgs. 56-61 in: W. Meshaka and K. Babbitt (eds.). Status and conservation of Florida amphibians and reptiles. Krieger Press, Malabar, Florida.

Means, D.B., T.E. Ostertag, and D. Printiss. 1994. Distribution, habitat ecology, and management of the striped newt (Notophthalmus perstriatus) in the Apalachicola National Forest, Florida. Final report to the U.S. Forest Service, Tallahassee, Florida. 30 pgs.

Means, D.B., R.C. Means, and R.M. Means. 2008. Petition to list the striped newt (Notophthalmus perstriatus) as a federally threatened species under the Endangered Species Act of 1973. July 10, 2008. 25 pgs.

Means, D.B., R.C. Means, and R.M. Means. 2010. Letter from Coastal Plains Institute and Land Conservancy to U.S. Fish and Wildlife Service on the 90-day finding for the striped newt providing status information for Apalachicola National Forest, May 17, 2010.

Means, R.C., R.M. Means, D.L. Miller, M.J. Gray, S.A. Johnson, D.B. Means, and R. Brenes. 2011. A Conservation Strategy for the Imperiled Striped Newt (Notophthalmus perstriatus) in the Apalachicola National Forest, Florida. First annual report to the U.S. Forest Service, Tallahassee, Florida. 26 pgs.

Means, R.C., R.M. Means, D.L. Miller, M.J. Gray, S. Reichling, S.A. Johnson, D.B. Means, and R. Brenes. 2012. A Conservation Strategy for the Imperiled Striped Newt (Notophthalmus perstriatus) in the Apalachicola National Forest, Florida. Second annual report to the U.S. Forest Service, Tallahassee, Florida. 38 pgs.

Means, R.C., R.M. Means, D.L. Miller, M.J. Gray, S.A. Johnson, D.B. Means, and S. Reichling. 2013. A Conservation Strategy for the Imperiled Striped Newt (Notophthalmus perstriatus) in the Apalachicola National Forest, Florida. Third annual report to the U.S. Forest Service, Tallahassee, Florida. 36 pgs.

Means, R.C., R.M. Means, S. Reichling, M. Beshel, B. Summerford, S.A. Johnson, and D.B. Means. 2013. A Conservation Strategy for the Imperiled Striped Newt (Notophthalmus perstriatus) in the Apalachicola National Forest, Florida. Fourth annual report to the U.S. Forest Service, Tallahassee, Florida. 35 pgs.

Moler, P.E. and R. Franz. 1987. Wildlife values of small isolated wetlands in the Southeastern Coastal Plains. Pgs. 235-241 in R.R. Odum, K.A. Riddleberger, and J. C. Ozier (eds.). Proceedings of the 3rd Southeastern Nongame and Endangered Wildlife Symposium. Georgia Department of Natural Resources, Atlanta, Georgia.

Myer, R.L. 1990. Scrub and high pine. Pgs. 150-193 in R. L. Myer and J.J. Ewel (eds.). Ecosystems of Florida. University of Central Florida Press, Orlando, Florida, Ouellet, M., I Mikaelian, B.D. Pauli, J. Rodrigue, and D.M. Green. 2005. Historical evidence of widespread chytrid infection in North American amphibian populations. Conservation Biology 19:1523-1739.

Padgett-Flohr, G.E. and J.E. Longcore. 2007. Taricha torosa (California newt). Fungal infection. Herpetological Review 38:176-177.

Petranka, J. W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington, D.C. pgs. 448-450.

Petrick, C. 2006. Telephone interview between Linda LaClaire and Carl Petrick, U.S. Forest Service, Tallahassee, Florida, regarding the use of off-road vehicles near salamander ponds on U.S. Forest Service lands. September 5, 2006.

Raffel, T.R., T. Bommarito, D.S. Barry, S.M. Witiak, and L.A. Shackelton. 2008. Widespread infection of the eastern red-spotted newt (Notophthalmus viridecens) by a new species of Amphibiocystidium, a genus of fungus-like mesomycetozona parasites not previously reported in North America. Parasitology 135:203-215.

Reilly, S. M. 1990. Biochemical systematics and evolution of the eastern North American newts, genus Notophthalmus (Caudata: Salamandridae). Herpetologica 46:51-59.

Rothermel, B.B., S. Walls, J. Mitchell, C.K. Dodd, L. Irwin, D. Green, V. Vazquez, J. Petranka, and D. Stevenson. 2008. Widespread occurrence of the amphibian chytrid fungus Batrachochytrium dendrobatidis in the southeastern U.S.A. Disease of Aquatic Organisms 82:3-18.

Ruppert, T. K., T. Ankersen, C. Covington, R. Feinberg, Y. Huang, M. McDonnell and A. Miller. 2008. Eroding long-term prospects for Florida's beaches: Florida coastal management policy. University of Florida Institute for Food and Agriculatural Sciences, Gainesville, Florida.

Semlitsch, R.D. 1998. Biological delineation of terrestrial buffer zones for pond-breeding salamanders. Conservation Biology 12:113-119.

Semlitsch, R. D. and J. R. Bodie. 1998. Are small, isolated wetlands expendable? Conservation Biology 12:1129-1133.

Semlitsch, R.D., and J.R. Bodie. 2003. Biological criteria for buffer zones around wetlands and riparian habitats for amphibian and reptiles. Conservation Biology 17(5):1219-1228.

St. Johns Water Management District. 2005. http://www.sjrwmd.com/rules/index.html. Accessed on September 29, 2010.

Smith, L. 2010. Email received from Lora Smith with Joseph Jones Research Center, Newton, Georgia to Annie Dziergowski, U.S. Fish and Wildlife Service, Jacksonville, Florida, regarding the status of striped newt at the Jones Research Center. September 11, 2010.

Snodgrass, J.W., M.J. Komoroski, A.L. Bryan, Jr., and J. Burger. 2000. Relationships among isolated wetland size, hydroperiod, and amphibian species richness: Implications for wetland regulations. Conservation Biology 14:414-419.

Stanton, E. A. and F. Ackerman. 2007. Florida and climate change: the cost of inaction. Tufts University, Boston, Massachusetts.

Stevenson, D.J. 2000. A review of habitat quality of Georgia historical striped newt (Notophthalmus perstriatus) localities and additional habitat surveys. Unpublished final report to the U.S. Fish and Wildlife Service, Jackson, Mississippi. 34 pgs. + maps.

Stevenson, D. J. and W. B. Cash. 2008. Striped newt, Notophthalmus perstriatus. Pgs. 251-253 in: J. B. Jensen, C. D. Camp, W. Gibbons, and M. J. Elliott, (eds.). Amphibians and reptiles of Georgia. The University of Georgia Press, Athens, Georgia.

Stevenson, D.J., W.B. Cash, and J. Jensen. 2009. Georgia Department of Natural Resources species accounts for protected animals: striped newt. http://www.georgiawildlife.com/sites/default/files/uploads/wildlife/nongame/pdf/accounts/amphibians/r Accessed on September 29, 2010.

Stevenson, D.J., J. Palis, A. Walde, A. Safer, and C. Thawley. 2009. New distribution records for Georgia amphibians and reptiles. Herpetological Review 40(2):247-249.

Thomson, W. 2010. State of public lands resource management need and program accountablility. Powerpoint presentation presented at The Wildlife Society Florida Chapter annual spring conference, April 21-23, 2010, Tallahassee, Florida.
Trenham, P.C. and H.B. Shaffer. 2005. Amphibian upland habitat use and its consequences for population viability. Ecological Applications 15:1158-1168.

U.S. Environmental Protection Agency and Department of the Army. 2001. Supreme Court ruling concerning Clean Water Act jurisdiction over isolated waters in Solid Waste Agency of Northern Cook County V. U. S. Army Corps of Engineers (“SWANCC”). Memorandum dated January 19, 2001.

U.S. Environmental Protection Agency and Department of the Army. 2008. Clean Water Act jurisdiction following the U.S. Supreme Court’s Decision in Rapanos V. United States & Carabell v. United States. Memorandum dated December 02, 2008.

U.S. Fish and Wildlife Service [Service]. 2006. Xcel spreadsheet

U.S. Forest Service. 1999. http://www.fs.fed.us/r8/florida/resources.php. Accessed on September 29, 2010.

U.S. Forest Service. 2010. http://www.fs.fed.us/r8/florida/apalachicola/recreation/ohv.rules.php?p=1.1.3.4. Accessed on September 29, 2010.

Wallace, M.P., D. Steveson, and L. LaClaire. 2009. Captive longevity and size records for the Peninsula newt (Notophthalmus viridescens piaropicola) and striped newt (Notophthalmus perstriatus). Bulletin Chicago Herpetological Society 44(9):138-139.

Wear, D. N. and J. G. Greis. 2002. Southern forest resource assessment: summary report. Gen. Tech. Rep. SRS-54. U.S. Department of Agriculture, Forest Service, Southern Research Station, Asheville, North Carolina. 103 pgs.

Wigley, T.B. 1999. Final Report Southeast Coastal Plain amphibian study. NFWF Project #97-074. 42 pgs.

Zhang, P., T. Pepenfuss, M. Wake, L. Qu, and D. Wake. 2008. Phylogeny and biogeography of the family Salamandridae (Amphibia: Caudata) inferred from complete mitochondrial genomes. Molecular Phylogenetics and Evolution 49:586-597.

Zwick, P. D. and M. H. Carr. 2006. Florida 2060: a population distribution scenario for the State of Florida. GeoPlan Center at the Univeristy of Florida. Gainesville, Florida. 29 pgs.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: 04/05/2016
Date

Concur: 12/15/2015
Date

Did not concur: ____________________ ________
Date

Director's Remarks: